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(54) An electric running machine.

(57) In an electric running machine of the type used for medical tests and athletic training, the variable-gradient rolling platform (1) is wired up to a microchip controlled circuit board (4) programmable from a keyboard (15) and designed to implement a linked sequence of different programs, each with its own platform speed and gradient parameters and a selected time to be matched (or a distance to be covered), in such a way as to simulate events or situations of varying nature typically desirable for medical tests and sports training; a countdown from the programmed time or distance can be started at the precise moment that the user (8) begins running, once the speed of the platform has picked up and steady operating conditions are established.

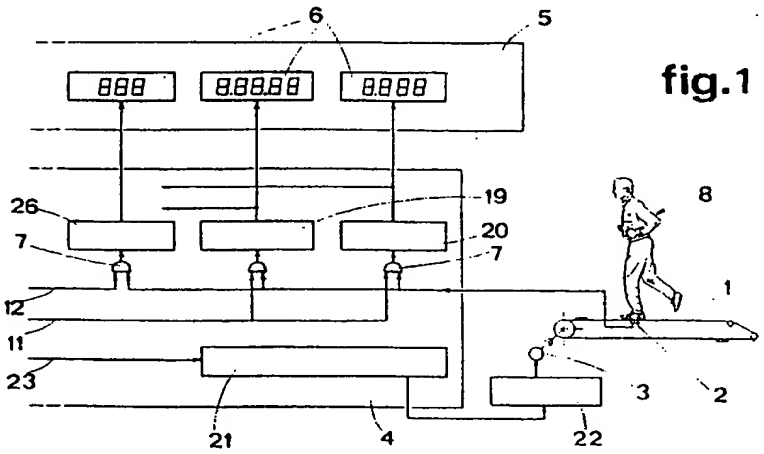

fig.1

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The present invention relates to an electric running machine.

The prior art embraces running machines of the type comprising a variable-gradient rotating platform, a console incorporating a keyboard and a numerical display, and a remote control by means of which to shut off the platform drive in case of emergency. Such machines are used by health enthusiasts, as well as for physiotherapy and general medical or training purposes.

Machines of the type in question are nonetheless beset by drawbacks, particularly when medical or training requirements are of a professional order. More exactly, whilst the machine effects a count of the distance covered, or of a set time, the count is started at the moment the platform begins to rotate, and thus comprises the time needed by the machine to accelerate to the point at which the selected operating parameters, e.g. platform speed and gradient, become steady.

A further drawback with the conventional machines in question is the impossibility of conducting specific medical/training tests that require the simulation of a particular distance with variable speed and gradient parameters.

The object of the present invention is to overcome the above drawbacks, and in particular to enable counting off a given time and distance, starting from the moment when an individual begins running or walking with the platform already turning at steady speed.

A further object of the invention is to enable the execution of a cycle of linked programs each with its own parameters, so as to simulate particular runs, and of a 'rest' program, in the event that the heart rate of the runner or walker rises above a certain threshold; also, to comprise a self-test system whereby any anomalous or erratic operating conditions can be readily identified, or even prevented.

The stated objects are comprehensively realized in a running machine as characterized in the appended claims, which comprises a microprocessor controlled electronic circuit board designed to commence the execution of a plurality of linked programs the instant that an individual begins running on the platform, each with its own respective parameters entered by way of a keyboard, and to implement a 'rest' program in the event that the heart rate of the individual training or exercising should rise beyond a selected reference threshold.

The invention will now be described in detail, by way of example, with the aid of the accompanying drawings, in which:

- figs 1, 2 and 3 are block diagrams illustrating the design and operation of the electronic part of the machine;
- fig 4 is a side elevation of the machine.

With reference to fig 1 and fig 4 of the drawings, 1 denotes rotating belt or platform loop driven by a motor 3 and comprising a capacitive dispersion type sensor 2 designed to pick up the footfalls of an individual 8 walking or running on the surface. The machine also comprises a handrail 16 on which the individual can lay hold or lean, a keyboard console 15 through which the machine is controlled a stop button 17 by means of which the belt 1 can be instantly shut off, and a tilt mechanism 18 by means of which the running surface can be elevated through an angled from horizontal to 25% gradient. Further manual controls are provided, located in the area of the stop button 17, by means of which to increase or decrease the speed and gradient of the platform.

The sensor 2 is wired into a microchip controlled electronic circuit board 4 that monitors the pace of the indivudual, and the time and distance run (or to be run).

11 denotes an enabling signal for the time and distance count, which is directed together with the signal from the sensor 2 into two AND circuits 7 of which the outputs are directed into two modules 19 and 20 counting time and distance, respectively. 12 denotes the enabling signal for a pace meter, which is directed together with the signal from the sensor 2 into a further AND circuit 7 of which the output is directed into a module 26 counting the number of footfalls per unit of time.

5 denotes a display board connected to the control board 4, which comprises a plurality of displays 6 indicating, for example, paces per minute, the time elapsed (hours, minutes, seconds), and the distance covered (km).

The control board is connected to the console 15, and more exactly to a button (not illustrated) that is used to start the countdown from a previously entered time or distance to be matched or covered, departing from the moment when the individual begins running or walking on the belt with steady operating parameters established.

21 denotes a further module controlling the drive system, which is in receipt of an input signal 23 reflecting a selected speed, and pilots the power board 22 of the motor.

Referring now to fig 2 of the drawings, 9 denotes a transmitter of electric pulses, corresponding to the heartbeat of the individual, which are carried through the ether by interferometric signals. The transmitter is attached to a chest band fitted with electrodes and worn by the individual.

10 denotes a receiver of the transmitted pulses, which enables the control board 4 to calculate the individual's heart rate and relay the result to one of the displays 6; the calculated rate is also set against a previously selected reference threshold rate by a comparator 13 forming part of

the control board 4. In the event that the calculated rate is lower than the reference, the system will implement a selected program 24, reflecting a given speed and gradient of the belt 1.

By contrast, if the calculated rate is equal to or greater than the reference rate, the system will implement an alternative, or 'rest' program 25 in which speed and gradient parameters less demanding than those of the selected program; similarly, the alternative program could be one designed to shut off the drive altogether.

Once the monitored heart rate returns to normal, i.e. lower than the reference, the control board 4 will cease execution of the alternative program 25 and resume the selected program 24 from the exact point when interruption occurred, continuing until the remaining time has elapsed (or the distance has been covered) and subtracting the additional time (or distance) attributable to the rest program.

The facility of switching programs automatically in response to monitored heart rate can be selected or deselected by way of a signal 14 directed into the respective AND circuits together with the output from the comparator 13.

With reference to fig 3, the keyboard console 15 mounted at the front end of the platform permits of selecting programs to be displayed or executed by depressing number keys that correspond to numerical identification codes for the respective programs.

Programs are stored in the memory of the control board 4 and can be modified, including the 'rest' program, simply by entering new speed, gradient and time or distance parameters as desired.

Specifications can also be entered when programming in respect of an identification code for a linked program sequence.

More exactly, as the selected program (containing a call instruction) is terminated, the linked program (subject of the call instruction), if any, will be loaded automatically and executed.

By this expedient, it becomes possible to execute a plurality of programs in succession, to the end of simulating a particular run, characterized, for example, by variable speed and gradient parameters. In the example illustrated, the linked program with identification code "0" is a shut-off command. The control board 4 is also designed to display the error codes relative to any anomalous or faulty situation that may arise during operation of the machine, for example, imbalance or instability in the power supply, overheating of the motor, lack of adequate lubrication at the platform, incorrect speed feedback from the motor; in such instances, the error will shut off the drive automatically.

The control board might also be RS232C-interfaced to an external CPU or personal computer to enable in-depth processing of data relative to programs currently being executed, and to the corresponding parameters.

Claims

1. An electric running machine, of the type comprising a variable-gradient rotating belt or platform (1) driven by an electric motor (3), and a console with keyboard (15) and displays (6), characterized
in that it comprises:

   - a microprocessor-controlled electronic circuit board (4) programmable by way of the keyboard (15), connected to the displays (6) and to a button of the keyboard serving to trigger a countdown from a selected time or distance that commences at the instant when an individual (8) begins running on the platform, and designed to enable the execution of a plurality of different programs linked in sequence, each with its own respective platform speed and gradient parameters and selected running time (or distance), capable together of simulating runs selected typically for medical tests and training routines;
   - a comparator (13), constituting a component of the control board (4), by which the heart rate of the individual (8) is monitored and compared to a previously entered reference rate to the end of implementing an alternative, or 'rest' program (25) of which the speed and gradient parameters are different to those of the selected program (24).

2. An electric running machine as in claim 1, wherein the control board (4), when programming from the keyboard, is designed to link each program selected (calling program) to a further program (program called) the execution of which occurs automatically on completion of the calling program, in such a way as to enable execution of a cycle of programs.

3. An electric running machine as in claim 1, further comprising a transmitter (9), attached to a chest band with electrodes worn by the individual (8) running or walking on the platform (1), by which heartbeat pulses are transmitted through the ether utilizing interferometric signals.

4. An electric running machine as in claim 1, wherein any anomalous or faulty situation that

may arise during operation of the machine causes a relative error code to be shown in the displays (6) by the control board (4), and automatically shuts off the platform (1).

5. An electric running machine as in claim 1, wherein the control board (4) can be interfaced with an external CPU or personal computer.

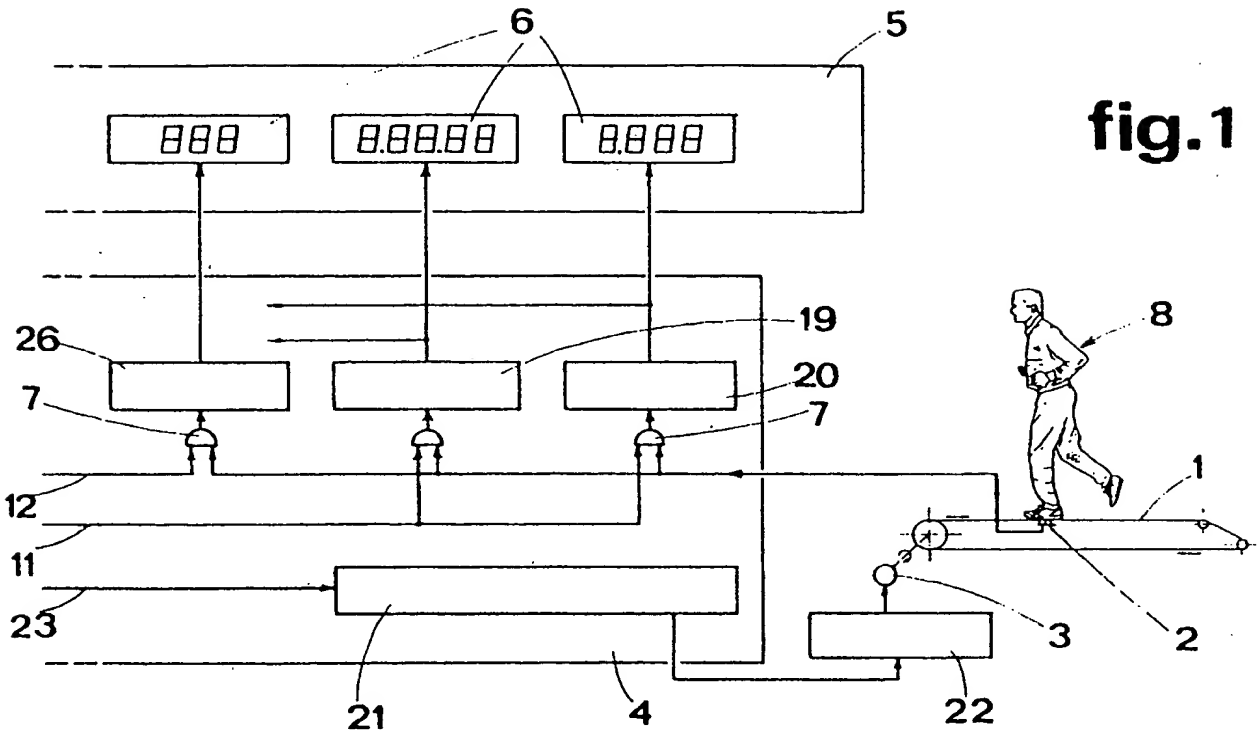


fig.1

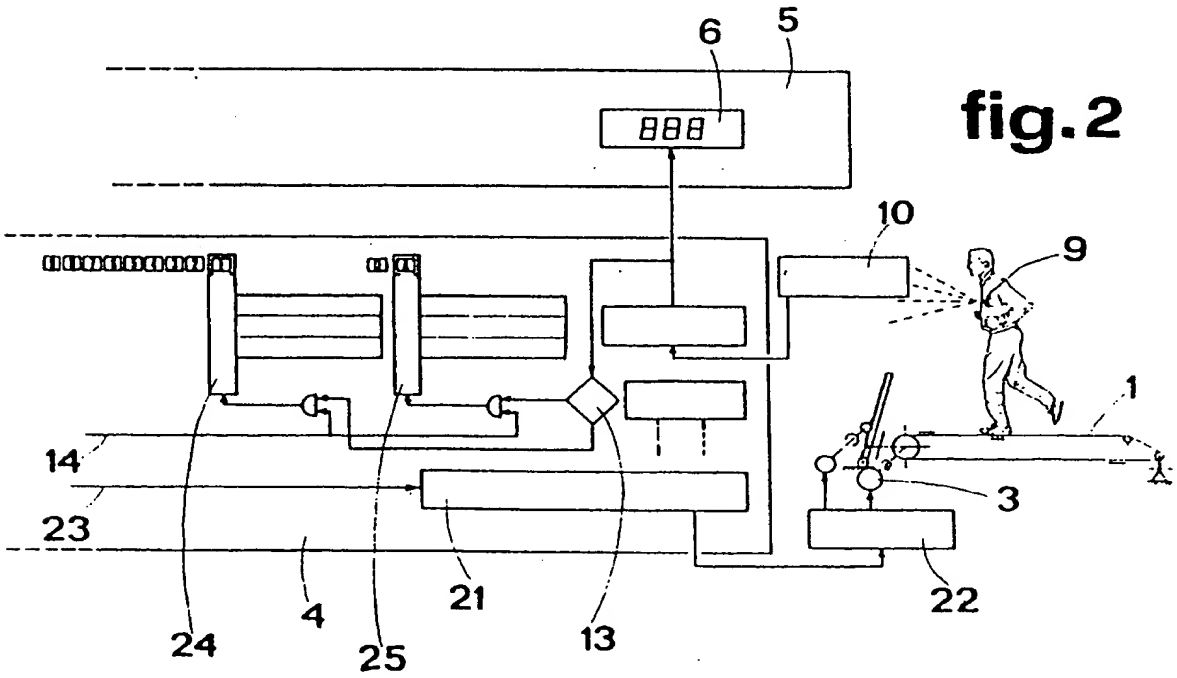


fig.2

fig.3

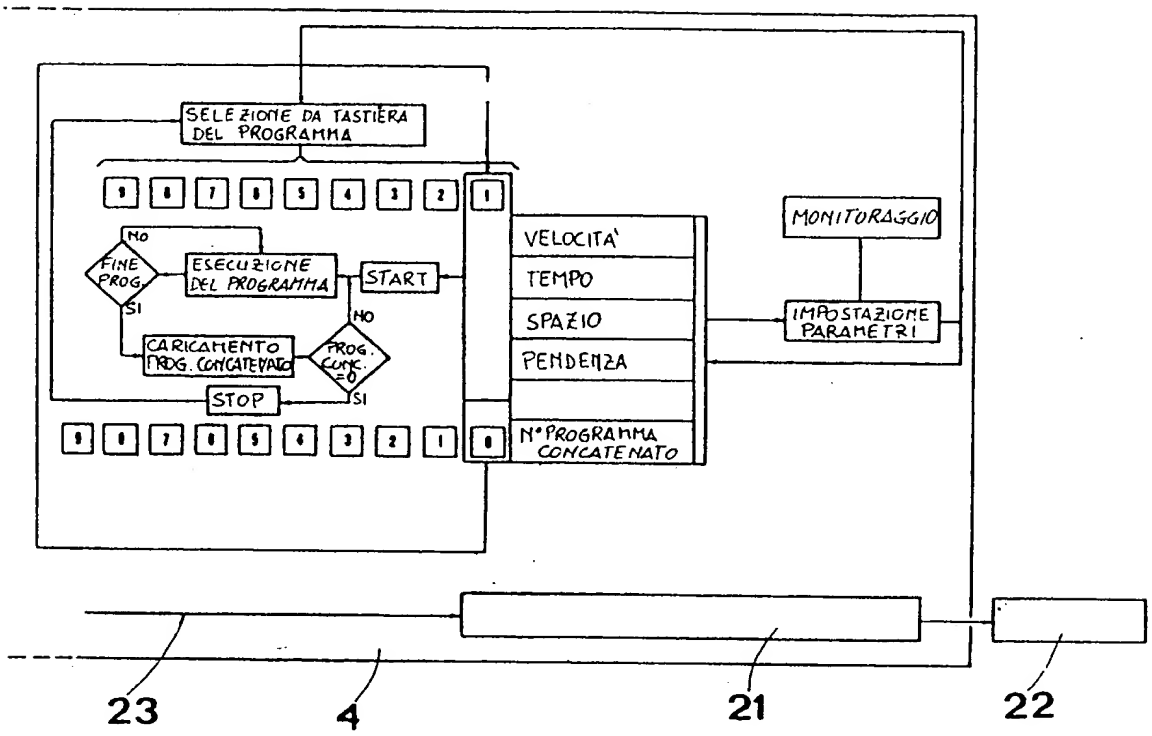
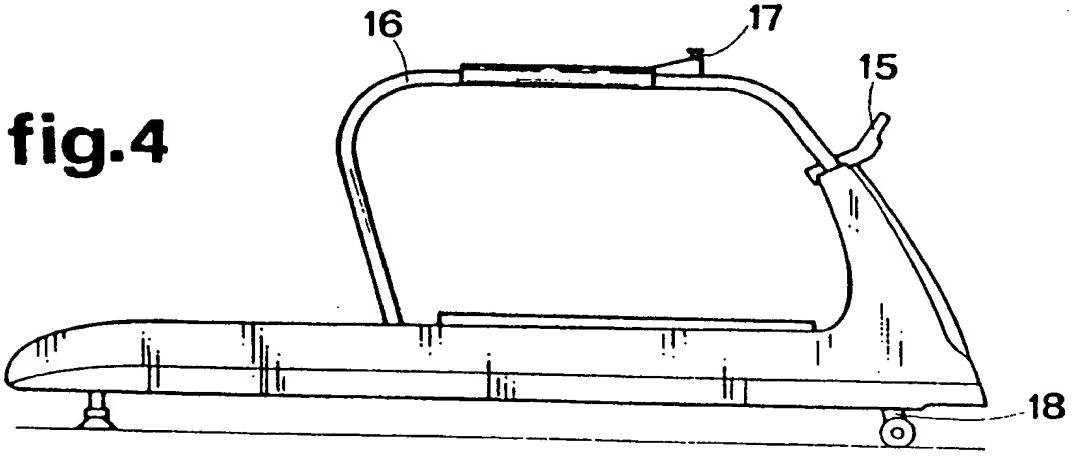

SELEZIONE DA TASTIERA DEL PROGRAMMA
9 8 7 6 5 4 3 2 1
NO
FINE PROG.
SI
ESECUZIONE DEL PROGRAMMA
START
CARICAMENTO PROG. CONCATENATO
NO
PROG. CONC. =0
SI
STOP
9 8 7 6 5 4 3 2 1 0
VELOCITA'
TEMPO
SPAZIO
PENDENZA
N° PROGRAMMA CONCATENATO
MONITORAGGIO
IMPOSTAZIONE PARAMETRI
23
4
21
22

fig.4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EUROPEAN SEARCH REPORT

Application Number

EP 90830242.5

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	DE - A1 - 3 601 054 (INDUSTRIAL TECHNOLOGIE) * Totality *	1,2	A 63 B 22/02
A	--	3-5	
A	US - A - 4 842 266 (SWENNEY) * Totality *	1,2,4, 5	
A	-- US - A - 4 749 181 (PITTAWAY) * Totality *	1-5	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

A 63 B 22/00
A 63 B 69/00
A 63 B 23/00

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	07-12-1990	SCHÖNWÄLDER

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